

1. A method to form metal silicide gates in the fabrication of an integrated circuit device, said method comprising:

- forming polysilicon lines overlying a substrate
- 5 wherein said polysilicon lines have dielectric sidewalls;
- forming a first isolation layer overlying said substrate and said dielectric sidewalls wherein said first isolation layer does not overlie the top surface of said polysilicon lines;
- 10 partially etching down said polysilicon lines such that said top surfaces of said polysilicon lines are below the top surface of said dielectric sidewalls;
- thereafter depositing a metal layer overlying said polysilicon lines;
- 15 thermally annealing to completely convert said polysilicon lines to metal silicide gates; and
- removing unreacted said metal layer to complete said device.

2. The method according to Claim 1 wherein said step of forming polysilicon lines further comprises:

- forming a dielectric layer overlying said substrate;
- depositing said polysilicon layer overlying said
- 5 dielectric layer;

depositing a hard mask layer overlying said
polysilicon layer;
patterning said hard mask layer; and
patterning said polysilicon layer to form said
10 polysilicon lines as defined by said hard mask layer
pattern.

3. The method according to Claim 2 wherein said hard mask
layer is removed prior to said step of partially etching
down said polysilicon lines.

4. The method according to Claim 1 wherein said step of
forming a first isolation layer further comprises:
depositing an interlevel dielectric layer overlying
said substrate and said polysilicon lines; and
5 planarizing said interlevel dielectric layer.

5. The method according to Claim 1 further comprising
implanting ions into said substrate prior to said step of
forming a first isolation layer to thereby form first doped
regions in said substrate and adjacent to said polysilicon
5 lines.

6. The method according to Claim 1 further comprising:

depositing a spacer layer overlying said substrate and
said polysilicon lines;

etching back said spacer layer to form spacers on said
5 sidewalls of said polysilicon lines; and

implanting ions into said substrate to thereby form
second doped regions in said substrate and adjacent to said
spacers.

7. The method according to Claim 6 wherein said polysilicon
lines are covered by a hard mask layer prior to said step
of partially etching down said polysilicon lines and
further comprising:

5 depositing a second metal layer overlying said
substrate, said spacers, and said hard mask layer prior to
said step of partially etching down said polysilicon lines;

thermally annealing to convert a part of said
substrate in said second doped regions to metal silicide;

10 and

removing unreacted said second metal layer.

8. The method according to Claim 6 wherein said spacers
have a width of between about 200 Å and about 1000 Å.

9. The method according to Claim 1 wherein said dielectric layer for a first group of said metal silicide gates is a first thickness, wherein said dielectric layer for a second part of said metal silicide gates is a second thickness, and wherein said first and second thicknesses are not equal.

10. The method according to Claim 1 wherein said step of partially etching down said polysilicon lines results in a thickness of said polysilicon lines of between about 100 Å and about 500 Å.

11. The method according to Claim 1 wherein said metal silicide gates have a thickness of between about 180 Å and about 900 Å.

12. A method to form metal silicide gates in the fabrication of an integrated circuit device, said method comprising:

forming said dielectric layer overlying a substrate;
5 depositing said polysilicon layer overlying said dielectric layer;
depositing a hard mask layer overlying said polysilicon layer;

patterning said hard mask layer;

10 patterning said polysilicon layer to form polysilicon
 lines as defined by said hard mask layer pattern;

 forming a first isolation layer overlying said
 substrate and said polysilicon lines wherein said first
 isolation layer does not overlie said hard mask layer;

15 removing said hard mask layer;

 thereafter partially etching down said polysilicon
 lines such that the top surfaces of said polysilicon lines
 are below the top surface of said first isolation layer;

 thereafter depositing a metal layer overlying said

20 polysilicon lines;

 thermally annealing to completely convert said
 polysilicon lines to metal silicide gates; and

 removing unreacted said metal layer to complete said
 device.

13. The method according to Claim 12 wherein said step of
forming a first isolation layer further comprises:

 depositing an interlevel dielectric layer overlying
 said substrate and said polysilicon lines; and

5 planarizing said interlevel dielectric layer.

14. The method according to Claim 12 wherein said step of forming a first isolation layer further comprises:

depositing a spacer layer overlying said substrate and said polysilicon lines; and

5 etching back said spacer layer to from spacers on said sidewalls of said polysilicon lines.

15. The method according to Claim 12 further comprising implanting ions into said substrate prior to said step of forming a first isolation layer to thereby form first doped regions in said substrate and adjacent to said polysilicon
5 lines.

16. The method according to Claim 15 wherein said step of forming a first isolation layer further comprises:

depositing a spacer layer overlying said substrate and said polysilicon lines;

5 etching back said spacer layer to from spacers on said sidewalls of said polysilicon lines; and

implanting ions into said substrate to thereby form second doped regions in said substrate and adjacent to said spacers.

17. The method according to Claim 16 further comprising:

depositing a second metal layer overlying said
substrate, said spacers, and said hard mask layer;
thermally annealing to convert a part of said
5 substrate in said second doped regions to metal silicide;
and
removing unreacted said second metal layer.

18. The method according to Claim 12 wherein said
dielectric layer for a first group of said metal silicide
gates is a first thickness, wherein said dielectric layer
for a second part of said metal silicide gates is a second
5 thickness, and wherein said first and second thicknesses
are not equal.

19. The method according to Claim 12 wherein said step of
partially etching down said polysilicon lines results in a
thickness of said polysilicon lines of between about 100 Å
and about 500 Å.

20. The method according to Claim 12 wherein said metal
silicide gates have a thickness of between about 180 Å and
about 900 Å.

21. A metal silicide gate MOS device, said device comprising:

a metal silicide gate overlying a substrate with a dielectric layer therebetween; and

5 spacers on the sidewalls of said metal silicide gate wherein said spacers are substantially taller than said metal silicide gate.

22. The device according to Claim 21 further comprising first doped regions in said substrate wherein said first doped regions are adjacent to edges of said metal silicide gate.

23. The device according to Claim 22 further comprising second doped regions in said substrate wherein said second doped regions are adjacent to said spacers.

24. The device according to Claim 21 further comprising metal silicide regions in said substrate wherein said metal silicide regions are adjacent to said spacers.

25. The device according to Claim 21 wherein said metal silicide gate has a thickness of between about 100 Å and about 900 Å.